Collecting Water Samples for Norovirus Outbreak Investigations

WASH Webinar

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Vincent Hill

CDC, Waterborne Disease Prevention Branch,

WASH Laboratory Team

National Center for Emerging and Zoonotic Infectious Diseases

Division of Foodborne, Waterborne, and Environmental Diseases

Why Collect Water Samples for Norovirus Outbreak Investigations?

- Bacterial indicators of fecal contamination not ideal models for viral pathogens
- Confirm that water source(s) contaminated with suspected etiologic agent and likely associated with WBDO
- Match nucleic acid sequence of norovirus in water samples with sequence from stool specimens
- Identify system deficiencies (e.g., well contamination, distribution system deficiency) and novel risk factors (e.g., consumption of ice from ice machine)
- Evaluate ongoing exposure risks

Water Sampling for Noroviruses

- Water sources typically sampled
  - Drinking water (tap water, ground water from wells)
  - Surface water (lake water, recreational area)
  - Others (e.g., ice machines)
- Sampling approaches
  - Grab samples (100 mL to 20 L)
  - Large-volume filtration (20-100 L using ultrafilters or other cartridge filters)
- Large-volume samples preferred–Why?
  - Dilution (dispersion, advection)
  - Time delays between contamination and sample collection
  - Uncertainty regarding where to sample
  - Pathogens present at lower levels than normal gut microflora

General Water Sampling Procedure

- Get to investigation site quickly
  - Lab can prepare supplies quickly and ship priority overnight
  - Establishing "water sampling kits" at state & local HDs ideal
- Determine appropriate sampling locations
  - Consult with water lab and epi staff
- Perform field water quality monitoring (as needed)
  - Free chlorine or total chlorine for drinking water or well water
  - Other parameters (e.g., pH, temperature, turbidity)
- Collect water samples
  - Use sterile technique (e.g., dedicated bottles and tubing; if reusing supplies, rinse well between sites)
- Dechlorinate with sodium thiosulfate (if needed)
- Ship samples to lab priority overnight

Collecting Drinking Water Samples

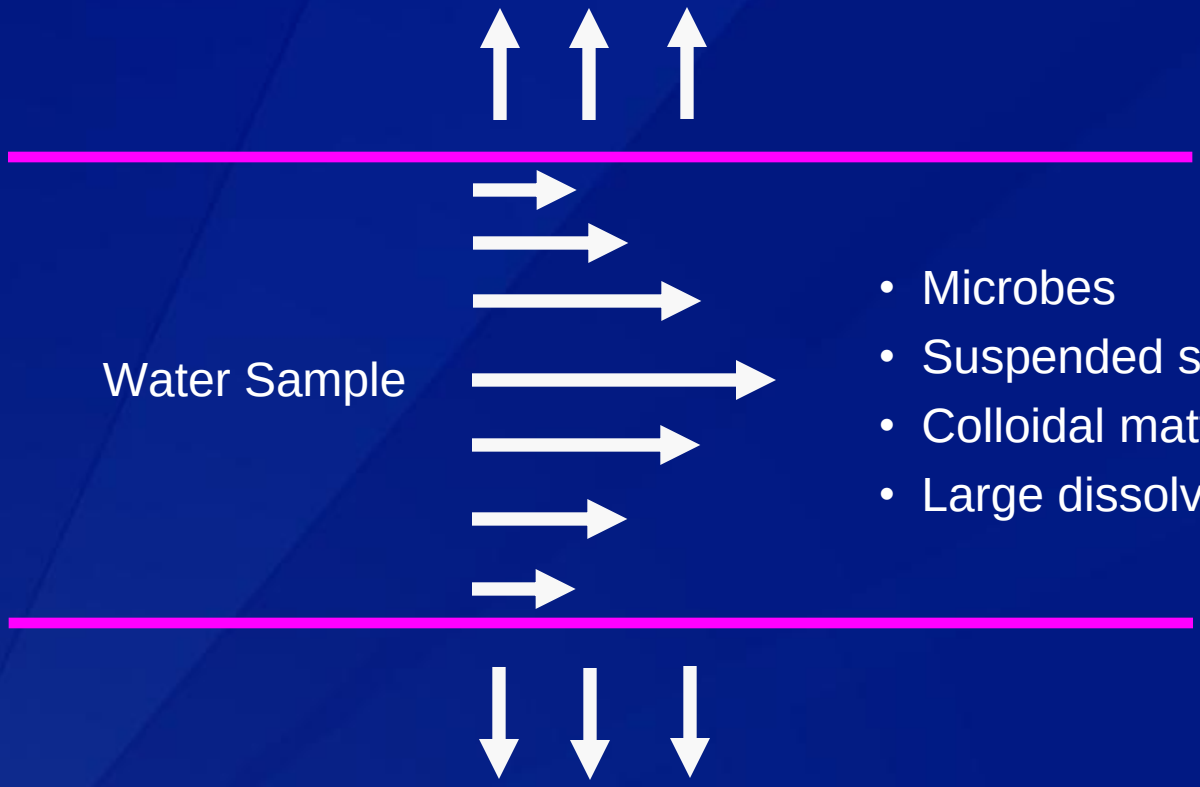
- Perform field water quality testing (as needed), especially free or total chlorine
- Collect 100- to 500-mL sample for bacterial indicators (as needed)
- Collect water sample using ultrafilter
  - Dead-end ultrafiltration [DEUF; see Smith and Hill (2009) *Appl Environ Microbiol*, 75:5284.]
  - DEUF effective for response to norovirus outbreak in Oklahoma (2008) associated with well water
- Dechlorinate ultrafilter or grab sample with sodium thiosulfate (as needed)

Anatomy of the Ultrafilter

Side ports

End ports

Principle: Flow through filter fibers



Water Sample

- Microbes
- Suspended solids
- Colloidal matter
- Large dissolved molecules

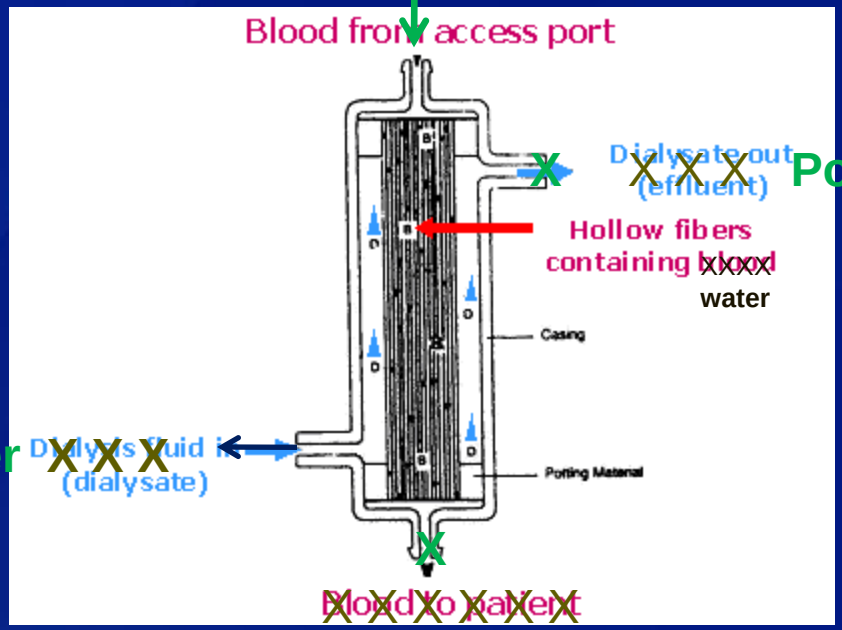
UF Membrane

Filtered Water

(aka “filtrate” or “permeate”)

Dead-End Ultrafiltration (DEUF) Using Dialysis Filters for Water Sampling

Water flows in



Port closed

Filtered water flows out

Port closed

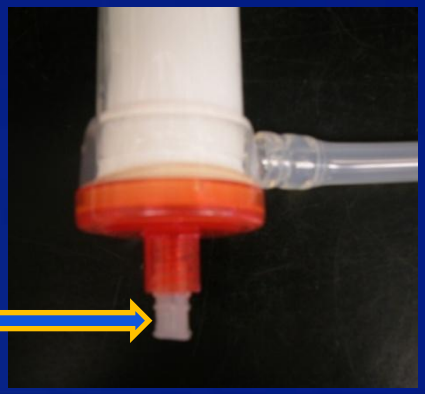
Procedure- Ultrafilter Set-up

End cap plug has been removed and set aside for later use. DIN adapter connected to L/S 24 influent port tubing is screwed in and secured with a hose clamp

NOTE: Ultrafilters are bi-directional. Either end-cap can be used for influent.

End cap plug (either one) has been pushed onto the port until a 'snap' is heard.

End cap plug has been removed and set aside for later use. Blood Port Cap has been screwed on tightly by hand.

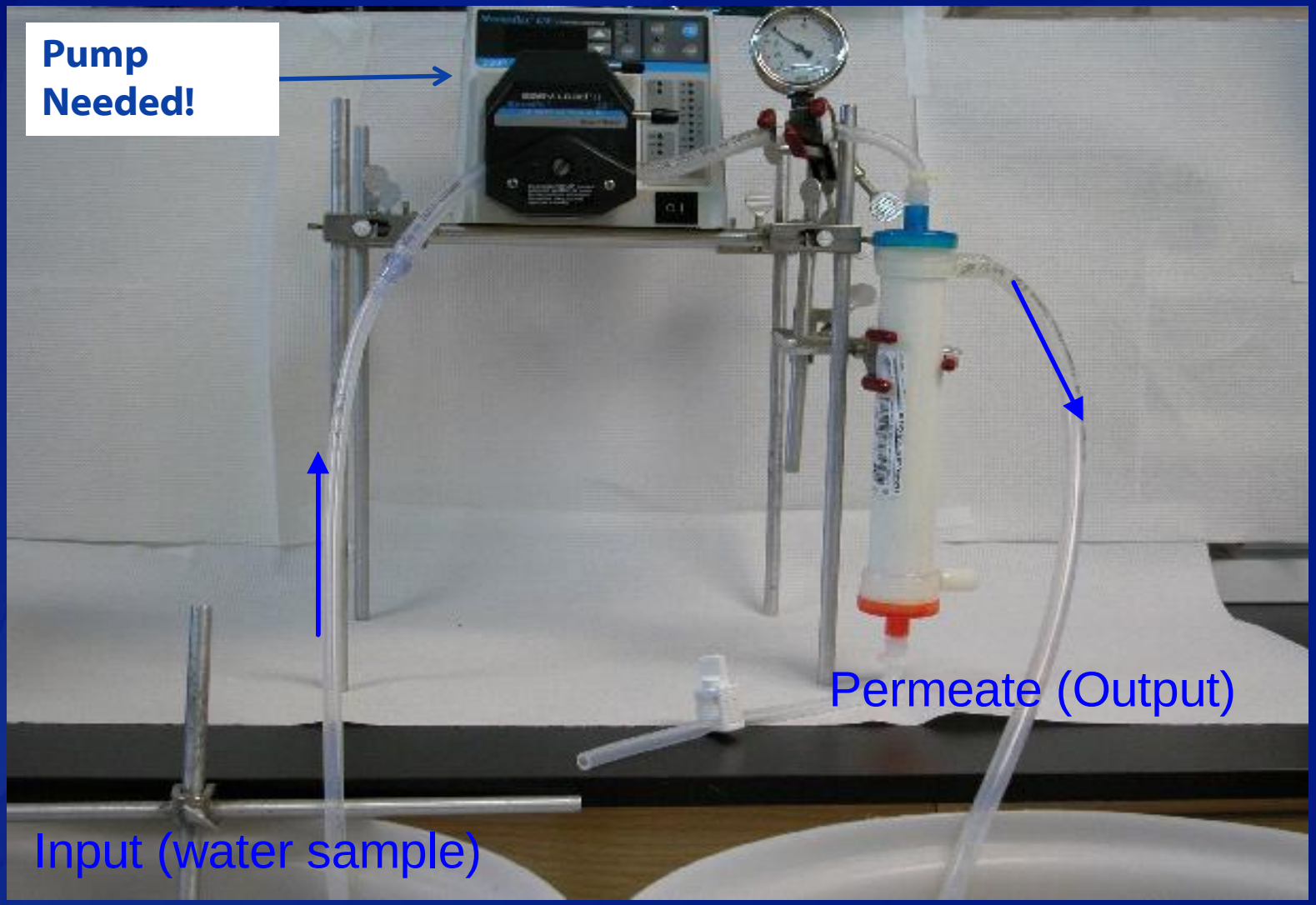


L/S 36 filtrate port tubing is attached to port by pushing the end of the tubing onto the port. No hose clamp needed.

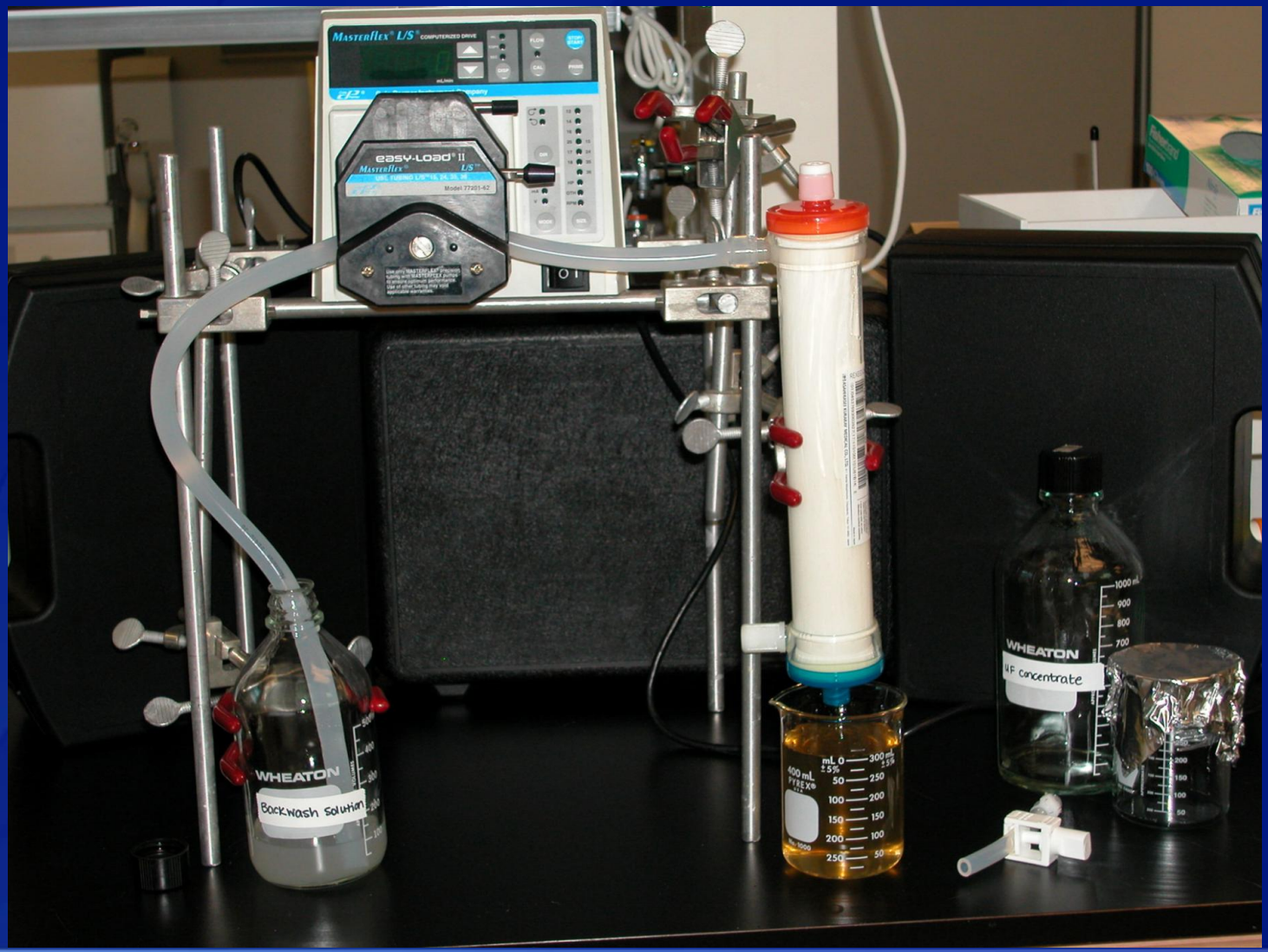
DEUF filter connection to tap

1. Open tap for 1 min
2. Connect ultrafilter to tap
3. Slowly open tap until flow rate through the ultrafilter = 2-3 L/min (measure flow rate using watch and graduated container)
4. Estimate total volume sampled (flow rate x time)
5. Close tap when desired volume is filtered
6. Disconnect tubing and ultrafilter
7. Cap ultrafilter using provided caps
8. Ship to lab priority overnight in chilled cooler (e.g., ice or freezer packs) –DO NOT FREEZE

DEUF Filtration (for non-pressurized source)



Back at the lab . . . .
Backflush filter to recover viruses



Shipping Water Samples

- Samples for norovirus testing should be chilled immediately (ice or freezer packs) and shipped priority overnight to the lab in coolers. Make sure coolers well-taped.
- Samples shipped to lab with field data sheets (note date/time of collection, site location, sample identification, water quality data, observations, etc.) and chain-of-custody form.
- Sample collection Monday-Thursday, for lab receipt on Friday (weekend receiving is risky)

Contact Information

Name	Office	Cell	Email
Environmental Microbiology (Lab phone: 404-718-4140)			
Vincent Hill	404-718-4151	404-312-3559	veh2@cdc.gov
Amy Kahler	404-718-4153		ete1@cdc.gov
Bonnie Mull	404-718-4156		gtx1@cdc.gov
Chandra Schneeberger	404-718-4154		ipq7@cdc.gov